

REMARKS:

Claims 1-18 are pending in the application. Reexamination and reconsideration of the application, in view of the following remarks, are respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a):

Claims 1-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 95/22907 (the '907 patent) taken with Petruccelli et al., (J. Agric. Food Chem. Vol. 43, pp. 2001-2006, (1995)) (Petruccelli). Applicant respectfully traverses this rejection.

Claim 1 is as follows:

A method for modification and isolation of a protein comprising:

- a) providing a protein selected from the group consisting of whey and soy proteins
- b) providing a reagent that forms sulfite ions;
- c) mixing the protein with the reagent under a condition to sulfonate the protein without using an oxidizing agent and to obtain a mixture containing a sulfonated protein;
- d) precipitating the sulfonated protein at an acid pH to form a precipitated sulfonated protein and a soluble sulfonated protein; and
- e) recovering the precipitated sulfonated protein or the soluble sulfonated protein.

Applicant respectfully submits that the cited references cannot render claim 1 obvious, because the cited references fail to teach or suggest a method for modification and isolation of a protein comprising: mixing whey or soy proteins with

a sulfite forming reagent under a condition to sulfonate the protein without using an oxidizing agent, precipitating the proteins, and recovering the proteins.

The present invention is based on the surprise discovery that in modifying proteins such as whey or soy, the sulfitolysis as such creates sufficient cleavage of disulfide bonds thus rendering oxidation unnecessary in order to change conformation of the protein molecules and to precipitate them in acidic conditions. Consequently, the oxidizing agent can be omitted from the protein modification/isolation method. This results in a method, which is simpler, faster, and more economical. (Applicant's specification, at page 6, lines 29-33).

The Examiner acknowledges that the '907 patent does not teach the sulfonation of proteins without using an oxidation agent. However, the Examiner appears to believe that the '907 patent "suggests that the use of oxidizing agent would decrease the yield of the product desired in large-scale production."

The Applicant respectfully disagrees with Examiner's reading of the '907 patent. The '907 patent fails to teach or suggest a non-oxidative sulfitolysis. Problems associated with product yields were not due to the use of an oxidizing agent, but rather due to the removal of copper by an EDTA treatment. The '907 patent states, "Before the precipitation it was, however, necessary to remove by an EDTA treatment the copper chelated to the sulfonated whey protein. In this case, also, the laboratory-scale implementation was cumbersome and complicated, requiring expensive apparatus and chemicals, as in the previous article." (the '907 patent, page 5, lines 17-24). Consequently, the decrease in yield of product was due to the removal of copper. Furthermore, there is nothing in the '907 patent that teaches or suggests using a non-oxidative sulfitolysis because of problems associated with the use of oxidizing agents.

Petrucelli cannot remedy the defect of the '907 patent. Petrucelli has no teaching or suggestion of precipitating or recovering whey or soy proteins, much less

of precipitating and recovering whey or soy proteins without the use of oxidizing agents. The Examiner, in reference to Petruccelli, states, "Reduction of soy protein isolates with sodium sulfite affects different subunits according to the reaction conditions employed; namely, mostly AB dimers are reduced if urea is used, whereas if Cu or O<sub>2</sub> is employed, mainly components other than AB-11S undergo change. The reference continues by stating that to obtain complete sulfitolysis, both urea and C or O<sub>2</sub> are required. The reference concludes by stating that the addition of a catalyst (Cu) and oxidizing agent (O<sub>2</sub>) affects similarly the sulfitolysis of soy proteins with Na<sub>2</sub>SO<sub>3</sub>; the simultaneous presence of both agents is not required. Thus, clearly showing that without using an oxidizing agent that one of ordinary skill in the art would be able to obtain complete sulfitolysis in a method for modification and isolation of proteins from whey or soy."

Applicant respectfully disagrees with the Examiner's statement that Petruccelli clearly shows "that without using an oxidizing agent that one of ordinary skill in the art would be able to obtain complete sulfitolysis in a method for modification and isolation of proteins from whey or soy." As indicated by the Examiner, Petruccelli does state that the simultaneous presence of both copper and oxygen is not necessary for sulfitolysis. (Petruccelli, page 2006, column 1, first paragraph under CONCLUSIONS). However, Petruccelli further states, "To achieve complete sulfitolysis with Na<sub>2</sub>SO<sub>3</sub>, not only is the presence of a denaturing agent needed, but it is also necessary to favor shifting of the equilibrium state of the reaction by means of an oxidizing agent. The use of O<sub>2</sub> has some advantages over that of Cu, since, even though its action is slower, Cu is kept within the protein structure; this situation is dangerous both from the functional and from the nutritional point of view." (Petruccelli, page 2006, column 1, second paragraph under CONCLUSIONS). In addition, Petruccelli teaches that the addition of oxygen and copper dramatically reduces the time necessary for soy protein isolates

to reach 75% of reduced apparent disulfide bonds groups. (Petrucelli, page 2006, column 1, third paragraph under CONCLUSIONS).

Accordingly, a person of ordinary skill in the art, having read Petrucelli, would be of the belief that an oxidizing agent is both practical and necessary to obtain complete sulfitolysis. As discussed above, it is the unexpected discovery of the present that complete sulfitolysis is not required for the isolation of proteins. (Applicant's specification, at page 6, lines 29-32). Therefore, based on Petrucelli's teaching and without the hindsight of the present invention, those skilled in the art would have used an oxidizing agent to sulfonate the protein.

Furthermore, Petrucelli has not teaching or suggestion, whatsoever, of precipitating and recovering sulfonated proteins. The Examiner maintains that "one of ordinary skill in the art would have been motivated to modify the method for modification and isolation of proteins from whey which requires oxidizing agent taught by the primary reference to substitute into a method for modification and isolation of proteins from whey without using oxidizing agent as taught or suggested by the secondary reference since the secondary reference has shown as discussed above that without using an oxidizing agent that one of ordinary skill in the art would be able to obtain complete sulfitolysis in a method for modification and isolation of proteins from whey or soy."

The Applicant respectfully disagrees with the Examiner's assertion that a person of ordinary skill in the art would be motivated to combine the '907 patent with Petrucelli. The sulfitolysis of the '907 patent occurs in 10-50 minutes. (the '907 patent, page 8, lines 3-4). The sulfitolysis of Petrucelli occurs in 15 hours if neither copper nor O<sub>2</sub> is employed. (Petrucelli, page 2006, column 1, third paragraph under CONCLUSIONS). A person of ordinary skill in the art would not be motivated to increase reaction times from 10-50 minutes to 15 hours.

Consequently, a person of ordinary skill in the art would not be motivated to combine these references.

In light of the foregoing, Applicant respectfully submits that the cited references could not have made claim 1 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Claims 2-11 depend from claim 1 and cannot be made obvious for at least the same reasons as claim 1. Withdrawal of these rejections is thus respectfully requested.

Applicant believes the foregoing amendments comply with requirements of form and thus may be admitted under 37 C.F.R. § 1.116(a). In addition, admission is requested under 37 C.F.R. § 1.116(a) as presenting rejected claims in better form for consideration on appeal.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,  
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